Indiana Department of Education
Academic Standards Course Framework

CONSTRUCTION TECHNOLOGY: ELECTRICAL I

Construction Technology: Electrical I includes classroom and laboratory experiences focused on the installation and repair of the electrical and wiring systems of physical structures. The course includes instruction on the reading of technical drawings and their application in construction processes. Topics include the relationship between views and details, interpretation of dimension, transposing scale, tolerance, electrical symbols, sections, materials list, architectural plans, room schedules and plot plans. This course covers both AC and DC circuits. Studies include electron theory, Ohm's Law, Watt's Law, Kirchoff's Law, series circuits, series-parallel circuits, electromagnetic induction, current, voltage, resistance, power, inductance, capacitance, and transformers. Students will demonstrate the use of electrical equipment, troubleshooting techniques, the installation of hardware, metering equipment, lights, switches, and safety procedures and practices. Students will use the underlying scientific principles related to electricity, electronics, circuits, sine waves, and Ohm's Law. Mathematical principles will be used to solve electrical problems. Students will also interpret health, safety, and welfare standards and codes as dictated by local, state or federal agencies.

- DOE Code: 4830
- Recommended Grade Level: Grade 11-12
- Recommended Prerequisites: Introduction to Construction
- Credits: 2-3 credits per semesters, maximum of 6 credits
- Counts as a Directed Elective or Elective for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- This course is aligned with postsecondary courses for Dual Credit:
    - Ivy Tech
        - CONT 101 – Introduction to Construction
        - CONT 106 – Constructions Blueprint Reading
        - CONT 127 – Electrical Basics

Dual Credit

This course provides the opportunity for dual credit for students who meet postsecondary requirements for earning dual credit and successfully complete the dual credit requirements of this course.

Application of Content and Multiple Hour Offerings

Intensive laboratory applications are a component of this course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences. When a course is offered for multiple hours per semester, the amount of laboratory application or work-based learning needs to be increased proportionally.

Career and Technical Student Organizations (CTSOs)

Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in SkillsUSA, the CTSO for this area.

Content Standards

Domain – Introduction To Construction Technology

Core Standard 1 Students examine concepts of basic shop safety and proper tool usage to ensure compliance with professional and governmental regulations.

Standards

- ETI-1.1 Demonstrate safe practices and procedures with construction tools
- ETI-1.2 Demonstrate basic shop and workplace safety procedures
- ETI-1.3 Properly use basic construction hand tools
- ETI-1.4 Use levels and transits
- ETI-1.5 Demonstrate the proper use of portable power tools
- ETI-1.6 Demonstrate the proper set-up and use of stationary power tools
- ETI-1.7 Interpret plans, specifications and codes
- ETI-1.8 Select appropriate tools to create a lab project built to plans or specifications
- ETI-1.9 Diagnose technical and wiring problems based on given information
- ETI-1.10 Interpret health, safety, and welfare standards as dictated by local, state or federal agencies

Domain – Construction Blueprint Reading

Core Standard 2 Students interpret data from plans, blueprints, and codes to ensure structures are built to specifications.

Standards

- ETI-2.1 Identify various elements used in commercial and residential blueprints
- ETI-2.2 Identify the types of architectural lines, symbols, notations, and abbreviations used in print reading
- ETI-2.3 Distinguish between types of drawings such as elevation views, section views, detail views, and construction materials
- ETI-2.4 Interpret and explain building specifications
- ETI-2.5 Define dimensioning standards
- ETI-2.6 Demonstrate the ability to read various scales used in print reading
- ETI-2.7 Read blueprints for structural and trade information
- ETI-2.8 Demonstrate knowledge and skills in reading various plot plans
- ETI-2.9 Think critically to evaluate technical problems and information

Domain – Electrical Basics

Core Standard 3 Students apply concepts of circuitry to ensure proper wiring of structure.

Standards

- ETI-3.1 Describe the differences in AC and DC current
- ETI-3.2 Explain the operation of capacitors, inductors, and transformers
- ETI-3.3 Identify various power sources

Core Standard 4 Students design electrical circuits to ensure correct wiring operations in structures.

Standards

- ETI-4.1 Draw a simple DC circuit and explain various components
- ETI-4.2 Describe the properties of resistance, voltage, current and power

ETI-4.3 Use Ohm's Law to calculate values

ETI-4.4 Use a multimeter to measure values in a circuit

ETI-4.5 Draw and explain series, parallel, series-parallel, open and short circuits

ETI-4.6 Explain the properties of magnetism and electro-magnetism

ETI-4.7 Describe the operation of capacitors, inductors, and transformers

ETI-4.8 Solve mathematical problems relating to electrical systems

Core Standard 5 Students apply appropriate procedures when working with electricity to ensure compliance with professional and governmental regulations.

Standards

ETI-5-1 Explain proper fusing and wire sizing

ETI-5-2 Explain proper safety practices when working with electricity

ETI-5-3 Think critically to evaluate technical problems and information

Process Standards

Common Core Literacy Standards for Technical Subjects

Reading Standards for Literacy in Technical Subjects 11-12

The standards below begin at grade 11 and define what students should understand and be able to do by the end of grade 12. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations – the former providing broad standards, the latter providing additional specificity.

Key Ideas and Details

11-12.RT.1 Cite specific textual evidence to support analysis of technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

11-12.RT.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

11-12.RT.3 Follow precisely a complex multistep procedure when performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure

11-12.RT.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific context relevant to *grades 11-12 texts and topics*.

11-12.RT.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

11-12.RT.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Idea

11-12.RT.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

11-12.RT.8 Evaluate the hypotheses, data, analysis, and conclusions in a technical subject, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

11-12.RT.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity

11-12.RT.10 By the end of grade 12, read and comprehend technical texts in the grades 11-CCR text complexity band independently and proficiently.

Writing Standards for Literacy in Technical Subjects 11-12

The standards below begin at grade 11 and define what students should understand and be able to do by the end of grade 12. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations – the former providing broad standards, the latter providing additional specificity.

Text Types and Purposes

11-12.WT.1 Write arguments focused on *discipline-specific content*.

11-12.WT.2 Write informative/explanatory texts, including technical processes.

11-12.WT.3 Students will not write narratives in technical subjects. *Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In technical, students must be able to write precise enough descriptions of the step-by-step procedures they use in their technical work that others can replicate them and (possibly) reach the same results.*

Production and Distribution of Writing

11-12.WT.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

11-12.WT.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

11-12.WT.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge

11-12.WT.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

11-12.WT.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectivity to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation

11-12.WT.9 Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

11-12.WT.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.